7.

The Operations *of* GOD *and* Nature, *from the Beginning of Things, to the Finiſhing of the* Vegetable *Creation, and the Appointment of the* Seaſons *of the* Year.

A

SERMON

PREACHED BEFORE

A SOCIETY of FLORISTS,

In the Pariſh Church of HACKNEY,
JULY the 25th, 1764,
(Being St. JAMES'S-DAY,)

And Publiſhed at the Requeſt of the SOCIETY.

By *JOHN FREE*, D. D.

> *All Things depend of one* Beginning, *and the* Beginning *depends of* that, *which is* ONE *and* ALONE.
> Mercurius Triſmegiſtus, B. iv. § 49.

THE SECOND EDITION.

LONDON:
Printed for the AUTHOR,
And Sold by W. SANDBY, at the Ship, oppoſite St. *Dunſtan's* Church, and J. WILLIAMS in *Fleet Street*; and
J. ALMON in *Piccadilly*.

A

PREFATORY EPISTLE,

Addreſſed to

A Great MAN in the CHURCH,

By Way of Advertiſement.

MY LORD,

IT is not ſo much upon the Score of old Acquaintance, or from a Motive of Gratitude for paſt Favours, that I trouble your GRACE with this Epiſtle, as for the Sake of giving a freſh Proof to the World, that at a certain *Period*, not in the * *fifteenth Year of* Tiberius Cæſar, *when* Pontius Pilate *was Governor of* Judea, *or* Annas and Caiaphas *the High-Prieſts*; but when your GRACE was *Primate* and *Metropolitan* of all ENGLAND; the *publick* Rewards of Merit, particularly the *Church-Preferments* being notoriouſly applied to the Support of *Ignorance* and *Deluſion*, the ARTS and SCIENCES became dependent upon the *Contributions* of *private* †Perſons, and the Study of DIVINITY was—LABOUR LOST.

Newington-Butts,
Auguſt 4, 1764.

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* *Luke* iii. 1.

† *N. B.* There is a Society in the *Strand* for the Encouragement of *Artiſts*; but the Study of *rational Theology* in *England* has no Society for its Support.

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THE

THE OPERATIONS OF GOD, and NATURE, &c.

Gen. Chap. i. Verſe 2.

The Earth was without Form,—

The Text why agreeable to the Occaſion of the Sermon.

IF we would be more truly ſenſible of the great Bounty of the Almighty Creator, in giving the *Earth* its preſent State of Beauty and Verdure, we ſhould take a View of it, in its Original *Deformity*, and trace it thro' its ſeveral *Stages* of EXISTENCE, till, from a rude and indigeſted *Chaos*, it became an habitable, and delightful World.

The rather, as all theſe Stages of Being ſerved at the ſame Time, as ſo many *Steps* and Preparations, towards the *Introduction* and *Formation* of the *Vegetable* and *Animal* Creation.

Since, without reducing the *Earth* to *dry Land*; giving *Elaſticity* to the Firmament, to ſeparate the Waters from the Waters, ſo as that they might flow in Rivers, or deſcend in Rain, without creating *Light* and its concomitant *Heat*, the greater *Vegetables* could never have exiſted at all, and the lower Tribes, if they had obtained a Being, muſt yet have remained in a State of Obſcurity and Imperfection.

The Explication of the Context

I. To ſee then more diſtinctly, how theſe Things are *combined* in NATURE, and the Progreſs, which the ALMIGHTY made from one Work to another, 'till he brought the whole to be *very good*, that is, to a State of *Perfection*; we muſt have recourſe to the Hiſtory of the Creation, as it ſtands recorded in this Book of MOSES, which, becauſe it gives a Detail of the *Generation* of all Things, is called, in the *Greek*, the Book of *Geneſis*, that is, of GENERATION: but in the *Hebrew* it bears another Title, namely *Bereſhith*, that is to ſay, *in the Beginning*, taking its Name in that Language, from the *firſt Words* of the firſt Verſe—*In the Beginning God created the Heaven and the Earth.*—By which Expreſſion ſome Commentators underſtand, that God in the *firſt Place* created the *Matter* or *Materials* of the *Heavens* and the *Earth*, which ſeems to be true in fact, and agreeable to the Senſe of the Hiſtorian, who immediately adds, that the Earth was *without Form*, and therefore it was only *Matter*. In this Part then the Interpretation ſeems to ſtand clear of any Exception, and if the Word ברשית had been rendered in *the Beginning*, the whole would have appeared to have been a reaſonable Account of Things. For though we allow the Obſervation of *Rabbi* SOLOMON upon the *Phraſe*

Phraſe to be juſt enough, to wit, that to have ſignified particularly, *in the firſt Place*, the Expreſſion ſhould have been בראשונה and not ברשית, yet it does not appear from hence, that all Order was excluded, or that we have any Reaſon to reject the Interpretation of *Kimchi*, who ſays, That in the *Beginning* God created the *Heavens* and the *Earth*, and *afterwards* ſuch Things, as proceeded from the ſame, which coincides with the *firſt* Interpretation, that the *Materials* of the HEAVENS and the EARTH were made the *firſt*, and afterwards the ſeveral *Forms* of Beings, now comprehended in the Univerſe, tho' all ſo near together, as that the ſeveral Operations might appear only as *Parts*, and *Diviſions*, of *one* great EVENT.

By creating the *Heavens* and *Earth* then, may ſtill be underſtood the *Creation* of the UNIVERSE, without deſtroying or denying the *Gradation* neceſſary to compleat the ſame; the Creator working, as he did, from no *Matter* to ſomething *material*, and then faſhioning that *Earth* or *Matter*, which the Scripture declares to have been *without Form*, firſt into the FORMS of *Dry Land* and *Water*, then creating the *Matter* of the *Firmament*, then the FORMS of *Trees* and *Vegetables*, afterwards the FORMS of *Animals*, and laſtly the *Forms* of *Human* Creatures, who were to govern the whole, and avail themſelves of the Labours and Produce of the Reſt, therein compleated the ſeveral *Parts*, which conſtitute the *Univerſe*, which *Univerſe*, or *all*

Things, *Moſes* compriſes both *diſtributively* and *collectively* under the Names of the *Heaven* and the *Earth*. For *creating* the *Materials* of both, was at the ſame Time the *Period* of EXISTENCE to both, and to every thing contained in them.

And becauſe Men generally look upon the Globe of the *Earth*, on which they live, as *one* PART of the *World*; and that immenſe Extent of Space, which like an Arch encompaſſes it, and to which they give the Name of *Heaven*, as the *other*; therefore the GENERATION of theſe is *emphatically* ſtiled the *Beginning*, it being the *Beginning* of all *material* Things.

The Seaſon of the Year.

It is natural to enquire here, at what Time of the Year this great Event was accompliſhed, and to ſatisfy this Enquiry ſome Attempts have been made by two ſorts of Arguments, the one quite conjectural, depending upon what People take to be the Reaſon of the Thing; the other upon *Aſtronomical*[*] Calculation.

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[*] Archbiſhop *Uſher* gives us to underſtand, that by his Calculation he found, that the World was made in the 710 of the *Julian* Period; the preſent Year of our Lord then 1764+4713 *J.* P. =6477—710=5767 Years ago; but then he ſays *poſito nimirum Autumno*—*Suppoſing* the Beginning of the Creation to have been in Autumn. But Mr. *Kennedy* tracing the Time back, from *Sept.* 9. H. 6. P. M. A. D. 1747, quite up to the *Creation*, ſays, we ſhall find the Beginning of the Computation at the Foot of the Fourth of the *Moſaic Hexaemeron*, i. e. Hours 6. P. M. At the Diſtance from the Point of (*Chaotick*) Oppoſition 1 Day + 12 Hours at leaſt. On this Day, ſays he,

The Arguments reſpecting the Reaſon of the Thing are founded upon the Congruity of one Seaſon above another, to the Wants and Neceſſities of the Unexperienced, and with regard to their own Induſtry, unprovided Inhabitants of the recent World, in which kind of Reaſoning vulgar Error has had its ſhare, as People whereſoever ſituated, have generally fixed upon a Seaſon, which in their own *Climate* would produce the Fruits of the Earth in the greateſt Abundance; not conſidering, that if the Region aſſigned by *Moſes* for the Place of the earthly Paradiſe † had

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he, the Sun began its Courſe at Noon, from the *Moſaic Tekupha*, or *autumnal Æquinoctial Point*. Beſides this, others believe that the Planets were altogether in the ſame Place of the *Ecliptick*, from that Paſſage in the Book of *Job*, chap. 38. 7. *When the Morning Stars ſang together, and all the Sons of God ſhouted for Joy*. A Conception of this Sort gave riſe to the Notion of the great *Platonick Year*, when, after performing their ſeveral Revolutions, they ſhall all arrive at the ſame Situation. Of the pretended Conſequences of this *Annus Magnus*, ſee more in *Seneca*, iii. *Queſt. Nat. c.* 20. The Point of Creation, according to this Syſtem alſo, was the firſt of *Aries*, which being one of the *northern* ſigns, they imagine that *Boreas*, took its Name from the *Hebrew* ברא as denoting this Event.

† The Place of Paradiſe at this Day is not exactly agreed upon, tho' *Moſes* has been ſo particular in delineating its Situation, by the *Diviſion*, and *Courſe* of the *Rivers*. The moſt probable Opinion ſuppoſes it to have been upon the united Streams of the *Dijlat*, i. e. *Hiddekel* and *Frat*, which *Dijlat*, called by the *Arabs Shat al Arab*, that is, the *River of the Arabs*, begins two Days Journey above *Baſrah*, and about four Leagues below divides again into two or three Channels, which empty themſelves into the *Perſian* Gulph. By this Hypotheſis the *Shat al Arab* is the River paſſing out of *Eden*; which conſidered according

had been very far to the South, at what Time it is *Summer* in the moſt northern Parts of the World, it muſt have been *Winter* there: but ſuppoſing it, at the Time of the Creation to have been Summer, or Autumn in the Garden of *Eden*, yet the Vegetables and Fruits of the Earth would not have been immediately in a State of Maturity fit for Uſe, unleſs they had been ſo created.

And as for any Inclemency of Seaſon, which might happen in this Climate, it is reaſonable to ſuppoſe that *Adam* and his Companion, or Companions, would have been able to have undergone ſuch Hardſhips, as well at their firſt Creation as three or four Months after. Since, even new-born Infants, by the Cuſtom of ſome Countries, are immediately hardened by Severities.

> *Durum a ſtirpe Genus. Natos ad Flumina primum*
> *Deferimus, ſævoque Gelu duramus, et Undis.* VIRG.

Arguments then of this ſort, for fixing the Seaſon of the Year, are but fallible; as thoſe a *Poſteriori*, tho' founded upon Aſtronomical

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ing to the Diſpoſition of its Channel, and not according to the Courſe of its Stream, is ſaid to be divided into four Heads or Branches, that is the *Frat* and *Dijlat*, or *Euphrates* and *Hiddekel* above the *Shat*, and *Piſon* and *Gihon* below; *Piſon* to the Weſt, and *Gihon* to the Eaſt, the Land to the Weſt of *Piſon* will be *Havilah*; the Land to the North-Eaſt of *Gihon*, will be *Cuſh*, or *Æthiopia*, called by the PERSIANS *Khuzeſtan* to this Day. And the Plot of the Garden itſelf will lie between the Degrees 65 and 66. E. Longitude from the *Iſland of Iron*, and between 30. and 31 Degrees N. Latitude.

nomical Calculation, for want of certain *Data*, are all *Hypothetical*. For antient Chronology being unſettled, and ſtrong Conteſts maintained about it; as well with regard to the *Form* of the Years, as the *Number* of them, they can in either Caſe only be *ſuppoſed* to be ſo, or ſo, as a Ground for Calculation. There is no Doubt indeed but that each Calculation may be true, according to its *Hypotheſis*; but then, which *Hypotheſis* ſhall be the true, has been diſputed; whether that, which depends upon the *Lunar* year of twelve Months, or the *Solar tropical* Year; and then again for the Number of years it is not determined, whether we are to be directed by the *Septuagint*, *Samaritan*, or *Hebrew*, CHRONOLOGY. Upon theſe various Principles various Calculations have been formed, and by the moſt probable it has been proved, that the *Earth* was created about four Days before the *Sun* began its Courſe from the Point of the *Autumnal Æquinox*.

But with regard to this, MOSES himſelf has made no direct Diſcovery, nor does it appear that he intended it, ſince he has not, like an *Aſtronomer*, informed us what Sort of Years he made uſe of, nor left us any other Account of the Diſtance of the Creation from from the Deluge, but that, which is to be gathered from the Regiſter of the Births and Burials of the antediluvian Patriarchs, in which *Regiſters*, thro' ſome Miſtake or other, there ariſes a Variation of above a thouſand Years.

The Chaos or State of Confuſion.

II. Without mentioning then the ‡ SEASON of the *Year* in particular, and only fixing ſome *Beginning* to the World, to prove that it was not eternal, MOSES in the next Place, proceeds to ſhew the *Poſture* Things were in, when GOD went about to *finiſh* and *compleat* it: to the End, that viewing it firſt in this *deſolate* and *frightful* Condition, and afterwards in its *Gaiety* and *Splendor*, we might entertain an higher *Idea* of the excellency of the *Workmanſhip*, and of the infinite WISDOM and POWER of the great CREATOR. The *Earth*, ſays he, *was without Form*, to ſhew, that what afterwards became *dry Land*, or *Earth*, was then a confuſed and ſhapeleſs Maſs of Matter. And thus far is intelligible in the *Engliſh*; but as for the Word *Void*, as it is referred to nothing in particular, the Idea is indeterminate, and conſequently it is a Word, that without ſome Explication conveys no ſenſe at all.

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‡ The Omiſſion however of ſuch a material Circumſtance as the Seaſon of the Year has been taken notice of, as carrying the Appearance of a very capital Deficiency in the Work of an *inſpired* Hiſtorian; which has been accounted for, by ſuppoſing that the *Beginning* of this *hiſtorical* Book of MOSES is *imperfect*.

Either as being a Collection he had made in haſte from the *ſecret* Theology, or Ἀπόῤῥητα of the *Ægyptians*, while he was a Student amongſt them, and which in the after Part of his Life, in the fatiguing Poſt of *Lawgiver*, and *Leader* to a refractory and rebellious People, he might never have Time to finiſh: or elſe, which indeed could not be prevented but by a perpetual Miracle, that the Book of *Geneſis* may have undergone the common Fate of other antient Writings, and been mutilated and corrupted in the Times of the *Jewiſh* Captivity; when the People had loſt all their Books and Learning, and even the *antient Character* of the Language. which obliged *Ezra* to give them an Edition of what he could find of the Bible in the *Chaldee* Letter, inſtead of the *Hebrew*, and moreover, where he found the Narration broken and obſcure, to interpret it in ſome Places by ſhort Interpolations, whereby he hath preſerved, as well as he could, all that now remains to us of the *Original* Bible.

The Earth was without Form, and void— void of what? of Inhabitants? if theſe Tranſlators then had ſaid *deſolate*, we ſhould have known their Meaning: For as the Earth was then without *Form*, without *Light*, and *without* a ſingle living Creature exiſting upon it, it was certainly a Scene of ſhocking Deſolation, and therefore the Seventy Tranſlators render the *Hebrew* words * תהו ובהו by ἀορατος καὶ ἀκατασκέυαστος not to be diſcerned; or what if viſible,

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* The Words תהום, בהו, תהו by the Rules of Inveſtigation ſhould be derived from the Radixes תהם, בהה, תהה, whoſe Meaning, as they ſeem to be obſolete, and not in uſe in the Bible, is certainly to be gathered rather from ſome other Dialect, or Language.

I am the more confirmed in this Opinion, becauſe in ſuch of their Interpretations, as I have ſeen, the Rabbies themſelves do not attempt to aſſign an *Hebrew* Theme or an *Hebrew* Explication, that bears any Reſemblance to the Words, or if to the Words, not to the received Interpretation: the *Chaldee* paraphraſe them by צריא וריקניא *deſolate* and *void*. Rabbi *Solomon* will have תהו to ſignify *ſtupendous Deſolation*, from תְּהה, which in the *Chaldee* Language ſignifies to *ſtand amazed*; and בהו to mean *Vacuity* and Deſolation. The *Arabick* takes in the Variations and Reciprocations of the *Chaldee*, from תהא with a *Vaw* in the laſt Place תהו will ſignify, it *was empty*, and בהא with a *Vaw* in the laſt Place will ſignify, when applied to an Houſe, that it was empty or quite unfurniſhed, which is viſible, one would not chooſe to look at, as being ſo totally naked and unprovided, that inſtead of a PARADISE, or the Fountains, flowery Banks, and Groves of *Eden*, our Imagination is terrified with the horrid Appearance of imperfect Nature; an Univerſe no better than a frightful Waſte; a Scene of Darkneſs, Defor-

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is juſt the ſame as תהא before; again if תהו be derived from תאת, with a *Vaw* in the Middle, that will ſignify *aſtoniſhing*, as in the *Chaldee* before. *Aben Ezra* ſubſcribes to the *Chaldee* Paraphraſt, and ſays, that *Bohu* is the Brother of *Tohu*, *i. e.* of a like Signification; and to ſhew that they are ſo, the *Cabbala denudata*, gives to *Tohu* the very Meaning, which our Tranſlators give to *Bohu.*—תהו *Communiter vacuum*—*Quid eſt* Bohu? *Res illa, quæ eſt Veſtis* τȣ̃ Tohu. *Quid autem* Tohu? *Aliquid quod ſtupeſcere facit Homines. Ergo* בהו *eſt Tale in quo aliquid eſt.*—Afterwards they would give us to underſtand that theſe Words ſignify *Matter* and *Form*; but this, tho' it may be true in Philoſophy, is far from a *literal* Derivation; and rather conveys to us the *Idea*, which the *Rabbies* had of the *Thing*, than the exact *Meaning* of the *Words*, which ſeems, in their Time, to have been loſt, and not perfectly underſtood, even by the *Hebrews* themſelves, or elſe they would ſcarce have given us ſuch a variable and lame Account of them. It is probable then, that theſe Words, like *Mo-uſes*, *Man-hou* and ſome others, are *Ægyptio-Hebræan*, that is, tho' in uſe amongſt the *Jews*, yet of *Ægyptian* Original, and borrowed from the ſecret Philoſophy of that *learned* Nation, with which the inſpired *Lawgiver* was well acquainted himſelf, and which, perhaps, he found more familiar to the People of the *Jews*, who had ſojourned long in the Country, than if he had given them new Terms, tho' of genuine *Hebrew* Extraction. Theſe Words therefore, tho' in uſe among the *Jews*, being like the Name of *Chaos* among the *Greeks* of *traditional* Meaning, and with reſpect to themſelves of *uncertain Original*; we may as well retain the Interpretation of the Seventy, as they are oldeſt *Tranſlators*, and ſay that the Earth was at this Time *inviſible*, and without *Preparation*, as this coincides ſo well with what immediately

Deformity, and dreadful Silence, without any Sign of an Inhabitant, but THE SPIRIT OF GOD MOVING UPON THE FACE OF THE WATERS.

By this *Spirit* of GOD, ſome have underſtood the *Holy Ghoſt*, but as the *Hebrew* Word is רוח, which in numberleſs Places of Scripture ſtands for *Air*, *Breath*, or *Wind*, it is moſt natural, to ſuppoſe, that it ſtands here for the *Air*, or *Wind*, likewiſe. Thus the *Targum* (of *Onkelos)* ſays, it was *a Wind from the Preſence of the Lord*, which blew upon the Face of the Waters, and *Aben Ezra* explains the Purpoſe, in ſending it, that it was *to dry them away*.

MOSES then, in this Deſcription, ſeems to comprehend the firſt *Principles* of NATURE, under the Words *Earth*, *Water*, *Air*, or *

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mediately follows in the Original; *Darkneſs was upon the Face of the Deep*. In Confirmation of the Obſervation that the Words were not purely of *Hebrew* Original, the Reader may ſee them with ſome Variation in the *Perſian* Tranſlation of the Bible:

¶ 1 *Dar aval afrid Choda maran aſman vemar anzenim*,
1 In the Beginning God created the Heaven and the Earth.
2 *Veanzenim bud thohi Ubeuan*,
2 And the Earth was without Form and void.——

* There are ſome Paſſages in *Sanchoniathon*, who wrote the Hiſtory of the *Phænicians*, beginning from the earlieſt Ages, in the *Phænician* Language, which greatly corroborate, what I have here advanced, and agree ſurprizingly with the Narration of MOSES. In the very outſet of his Book he ſays, that in the Beginning there was a *Breath of dark Air*, according to his Tranſlator. *Phylo Byblius*, πνοὴν ἄερος ζοφώδεις, which from כהות ערב *Chaüth Ereb*, he calls χάος ἐρεβῶδες. Hence the *Chaos* of the *Greeks*, ſo *Heſiod*.

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Ætherial Spirit, which probably comprehended Fire, or was to produce it; becauſe that muſt have ſubſiſted ſomewhere, as all the *Elements*, tho' called by diſtinct Names, were as yet in a mixed State, and tho' ſeparate, and diſtinct by Nature, yet blended in a common Maſs.

For as to the *Texture* of the *primæval* Earth, we cannot imagine it to have been ſo firm and compact, as that we behold at preſent, and therefore MOSES making a Diſtinction calls it תוֹם, or the *Abyſs* of *Mud*. For it ſeems moſt

Εκ χάεος δ᾽ ερεβός τε, μέλαινά τε νύξ ἐγένοντο.

In the next Place he tells us, that from the Wind's Agitation of the *Chaos*, there at length emerged Μώτ in the orinal *Phænician* מור, that is to a Letter the *Engliſh* Word MUD. There is undoubtedly a ſurprizing Similitude between ſome Words in our Tongue, and others in the oriental, particularly the *Perſian* Language: for which Reaſon, ſome learned Men have imagined, that our Anceſtors the *Saxons* were the *Sacæ* of the *Eaſt*, before they ſettled in *Denmark* and *Germany*; but our Hiſtorian *Verſtegan* contends for the contrary, and ſays, that they rather went as Allies with the *Gauls* in the great Expedition, under *Brenuus*, and ſettling in *Aſia*, remained there ever ſince: be this as it will, there is undoubtedly an Affinity in the Languages.

But *Sanchoniathon* proceeds and ſays, that this *Mud* was the Generation of the Univerſe, and a Seed-plot, from which aroſe the Seeds of every Creature. He adds, that there were found alſo *intelligent Creatures which did not perceive by Senſe*; theſe are ſuppoſed to be the *Angels*, as he calls them, beſide ζωφασημὶν, that is in the *Hebrew* צופה שמים, that is, *Beholders of the Heavens*. He ſays, that *Men* were made ἐκ τȣ κολπία ἀνέμȣ, that is, קול־פי־ה, which refers to *Breath of Life*, mentioned by *Moſes*. He calls the *Name* of the firſt *Woman* BAAUT, a Relation (according to the Criticks) of BUT or BOOT, which ſignifies, in the *Phœnician* Language, to lie all Night with.

moſt probable to ſuppoſe, that at the firſt Creation the *Seeds* and *Principles* of all *natural* Bodies, afterwards viſible, were variouſly and confuſedly mixed together; and yet, notwithſtanding this Mixture and Confuſion, which the *Greeks* called *Chaos* (therein corrupting the *Phœnician* Word *Chaoth*, which ſignifies *Darkneſs*) there lay concealed a certain determinate Number of Principles or little Bodies of different Figures, and Sorts not changeable, or tranſmutable, by the Force of any natural Agent, not even of the Fire itſelf; and that this *Chaos*, conſiſting partly of ſolid and more ponderous, partly of fluid and lighter Principles, the ſolid and more ponderous naturally ſubſided, and the Fluid and Watery, as being more light, got above them. The *ſolid* and *ponderous* Parts, tho' they were of various Figures, and perhaps of different Natures, were all called by the common Name of *Earth*, and the *Fluid* by the Name of *Water*, and the Spirit of God, which we have before explained, to be the *Air* or *Ætherial* Matter, moved upon the Face of the Waters.

The Creation of Light, &c.

III. This *Motion* or *Action* of the *Air* upon the *Waters*, according to ſome of the Jewiſh *Rabbies*, was not barely for the Sake of drying thoſe Waters away, as was obſerved before, but rather for the Sake of producing ſomething out of them, as the *Hebrew* Word ſignifies *Foſtering* or *Cheriſhing*, after the Manner a Bird מרחפת when ſitting upon an Egg to hatch it. Indeed the Conſequence of this *Incubation* or Motion ſeems to have been the Production of *Light*, which might be generated ſomewhat after the Manner that Lightning is now, by cauſing *Fermentations* in the *Æther*. For if we conſider a little more diſtinctly the Nature of this *Primæval* LIGHT and DARKNESS, we ſhall find, that the DARKNESS is here repreſented as ſomething *poſitive*, a *dark Thing*. For it could not be as it is now, a *Privation* or Removal of Light, as Light at that Time had never exiſted. By this Account then MOSES repreſents the *Heavens* or *Æther* to have been originally in a State of Darkneſs. For which Reaſon we may ſuppoſe the *Ætherial Matter*, to have been created at *Reſt*, or to have remained at *Reſt*, after it was created, and that its *Concretion*, *Stagnation* or *Reſt*, was the Cauſe of *Darkneſs*: as contrariwiſe the *Fermentation*, *Fluidity*, and *Diſſipation*, of the *ſtagnating* Æther (probably the Effect of Fire) may be concluded from what we now obſerve in NATURE to have been the Cauſe of Light. Agreeably to this Hypotheſis we read in the following Verſe, that "*God divided the Light* "*from the Darkneſs*;" that is, he unlocked a Quantity of the elementary Fire, which is naturally luminous, from its impriſonment in the other Elements, which by its natural Levity, aſcended in great Quantities, and formed a Body in its proper Place. For ſtill a Portion of it muſt remain below incloſed in the Texture of every Thing that exiſts in

Nature, ſince without it there would be no ſuch Thing as *Animals* or *Vegetables*, no, not even † *Fluidity* to Water; but inſtead of growing, every Thing muſt *freeze* to the Place it ſtood upon, and the whole Creation turn a Globe of Ice. As much of the *Elementary Fire* then, as could be ſpared from the Support of *animal*, *vegetable*, and *natural* Bodies, being diſcharged by the Almighty *Fiat* from its lower Offices aſcended to the higheſt Place, where, if the Earth were then in a State of Rotation, it muſt produce the Appearance of Day and Night. And ſomething of this Sort there muſt have been effected, or MOSES could not have pronounced, that the *Evening* and the *Morning* were the *firſt* Day. For he does not mention the Creation of the *Sun*, *Moon*, and *Stars*, till the *fourth*, and therefore till then, ſome ſuch *Inſtrument* or *Phænomenon*, as *Fire*, muſt have afforded *Light* in their Place, without which the *Order* and *Regularity* of the Creation would have been loſt, as well as all the *Beauty* of it, which with reſpect to us, is not diſcernable but by the Light.

The growing CREATION, being the firſt Day thus *enlightened*, God proceeded in his *Operations*. The ſacred Hiſtorian divides the Buſineſs into ſix Days, and particularly ſets down what Beings God created every Day. Light was the Production of the firſt Day, and the Revolution of the Earth occaſioning two Appearances during that Revolution, namely, one of Light and one of Darkneſs, they are both ſet down, as together meaſuring or determining a natural Day: and the ‡ *Evening* and the *Morning* made *one* Day, which may alſo be tranſlated the *firſt*. The ſecond produced the Firmament. *And God ſaid let there be a Firmament in the midſt of the Waters, and let it divide the Waters from the Waters,* &c.

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† See more of this in the Author's Treatiſe of *Phyſiology*, under the *Article* of FIRE.

And God called the *Firmament* HEAVEN, and the *Evening* and the *Morning* were the ſecond Day.

The Creation of the Firmament

IV. Upon reading this Deſcription, it ſeems natural to enquire in the firſt Place, what is meant by *Firmament*, as that Word is not of *Engliſh* but *Latin* Original, and therefore ſeemingly interpreted by the *Engliſh* Word *Heaven*, as a Phraſe the more intelligible of the two, at leaſt to us.

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‡ The Word DAY is here taken in a larger Senſe, ſo as to comprehend alſo the Night, and to denote a whole Revolution of the *Sun*, or rather of the *Earth*, tho' DAY, *ſtrictly* ſpeaking as it is oppoſed to *Darkneſs*, is moſt properly and naturally determined by the Sun's riſing and ſetting, and ſo to be defined by the Stay of the Sun above the *Horizon*, as Night is the Stay of the Sun below the *Horizon*. Day in the *larger Senſe* is very well expreſſed by the *Greek* Word *Nuchthemeron*, and this *Nuchthemeron* may be reckoned from *Sun-ſetting* to *Sun-ſetting*, which ſeems to be the Meaning of ויהי ערב ויהי בקר, which was retained by the *Jews* and *Athenians*, and by the *Italians* ſtill, or from *Sun-riſing* to *Sun-riſing*, as did the *Babylonians*, or from *Mid-day* to *Mid-day*, as do the Generality of *Aſtronomers*, and likewiſe the *Arabs*, or laſtly from *Mid night* to *Mid-night*, as did the old *Ægyptians*, and *We* of this Iſland, together with the *French*, the *Germans*, and other *Europeans*. Dr. WELLS's *Chronology*.

The Word *Firmament* then ſeems to have been invented to interpret the ςερέωμα of the Septuagint or *Greek* Tranſlation, ſignifying Firmneſs or Conglobation, which however is like the reſt, no more than a Tranſlation of the *Hebrew* Word רקיע, to which we are to go in the firſt Place for Information, as to the Fountain Head; from whence, however, we muſt not expect to gain any intimate Knowledge of the internal Nature or *Eſſence* of the Heaven, any more than of the Eſſence of Fire, Water, Earth, or any other Element, but only of its *Qualities* and Office, as it is the great Bond or Stay, which holds the Reſt of the Creation together, and keeps the ſeveral Parts, as God divided them, ſtill ſeparate in their Place, more eſpecially as it affords to us the mild and temperate Medium of the *Atmoſphere* and all the fertile Uſes of the ſame.

With Regard then to the *primary* Meaning of the *Hebrew* Word רקיע, from which we are to form an Idea of the *Power* and *Agency* of the *Material* Heaven, we muſt collect the ſeveral Notions, which, in the Opinion of the Critics, are comprehended in it. *Aben Ezra* ſays, that it ſignifies דבר נטוי, a Thing extended. *Fagius* tell us, that the Heavens are ſo called from their *Expanſion*, i. e. from their being *expanded*, or *ſtretched* out upon the Earth: to which the Expreſſion in the

Pſalms (civ. 2.) has Reference, "Who "ſtretcheſt out the Heavens like a Curtain." But *Iſaiah* goes further, and deſcribes the Cauſe to be the immediate Act of God. It is he, that *ſitteth upon the Circle* of the Earth, that ſtretcheth out the Heaven as a Curtain, and ſpreadeth them out as a Tent, to dwell in. This Figure of *ſitting upon the Circle* of the ambient Air, and ſpreading it out by Preſſure, conveys at the ſame Time a very ſenſible and ſtrong Idea of the Agency of the Almighty, and of the conſequent Springineſs and Elaſticity of the Æther derived from this Compreſſion.

Fuller gives us a Solution, which exactly correſponds with this Deſcription; by obſerving, that the very Reaſon, why the *Septuagint* introduced the Word, which we render Firmament, was, becauſe they had an Eye to the *Syriac* Verb רקע, which is likewiſe interpreted by the *Greek* πιέζεν, and ſignifies to *uſe Force upon*, to *compreſs*, *condenſe*, or keep in *cloſe Order*. He adds, that this was the *primary* Signification of the *Hebrew* Verb, and that the Meaning of being *extended*, and *dilated* came to be added, as a *Conſequence* of this *Compreſſion*.

This Effect of the Air's Elaſticity, is finely and exactly expreſſed by our *Engliſh* Word Heaven, if we are *Engliſhmen* ſufficient to trace it from its * *Saxon* Original.

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* The original Word in the *Engliſh-Saxon* Lord's Prayer, as it ſtands in Mr. *Whelock*'s Edition of BEDE is Heoꝼenum.

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For in the firſt Place, the Word *Heaven* is not *ſingular* but *plural*, and ſo not only more expreſſive of the *Hebrew* שמים, which is of the *dual* Number, but alſo of the very *Idea* of the *Expanſion* of the *Air* after *Confinement*, by its being *heaved* up, or *Heaving*. So that hereby, is not only underſtood the *Situation* of the Heavens, as tho' they were ſo called, on Account of their being *heaved* up, and *exalted* above the Earth; but alſo their *Power* of *heaving* themſelves, by their *Springineſs*, and *recovering* their Place again, upon any *Depreſſion*.

This † *Stiffneſs*, and *Elaſticity*, communicated to the *Æther*, by the unalterable Will of God, hath enabled it ever ſince to anſwer the

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Ðu uꞃe Faꝺeꞃ ðe eaꞃꞇ on heoꝼenum, &c.
Thou our Father which art upon the Heavens, &c.

Where beſide the very Image given us by the Prophet of God's ſitting upon the Heavens it appears that Heaven is the plural Number. Secondly, we may diſcern a greater Affinity between the Noun and its antient *Theme* the *Verb*. The *Low Dutch*, which is a Dialect of our *Saxon*, preſerves in Uſe to this Day both the antient *Engliſh* and modern. To *heave* in that Language being expreſſed by *heaven*, *heffen*, *opheffen*.

In a *French* Tranſlation of the *Engliſh Liturgy*, printed in the Reign of King *William* III. the proper Number is alſo retained;

Noſtre Pere que es aux Cieux, &c. which Plurality ſhould inform us, that there is a Diſtinction in the Heavens, that is, a Difference between the common Air, and the Æther.

† The *elaſtick* Force of this *Medium*, in proportion to *its* DENSITY, muſt, according to Sir *Iſaac Newton*, be above 490,000,000,000 Times greater than the *elaſtick* Force of the common *Air* is according to *its* DENSITY—NEWTON's

the general *Uſes* of the Creation; the firſt of which was that of dividing of the Waters from the Waters, *i. e.* the Waters which were above the Firmament for their different Purpoſes, and the Waters under the Firmament for theirs. The *Æther* in the firſt Caſe, by its Elaſticity, ſerving as a Vehicle for theſe Exhalations, which being condenſed in Clouds, either deſcend in Hail, or Rain, or Snow, or elſe are carried to and fro continually, to cool and refreſh the *Atmoſphere*, and make it, by its Temperature, the Inſtrument of Life and Health, to every Thing exiſting upon the Earth; not only to Animals, but to Trees and Plants, who owe their Strength and Vegetation to the Atmoſphere, as is manifeſted

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TON's *Opticks*. Moreover, by this *ætherial* Medium, he ſuppoſes that "Light (*Queſt.* 21.) is *reflected* and *refracted*, by whoſe *Vibrations*, LIGHT communicates HEAT to Bodies, and is put into Fits of eaſy *Reflection*, and eaſy *Tranſmiſſion*: and do not the *Vibrations* of this *Medium* in hot Bodies contribute to the Intenſeneſs and Duration of their Heat? And do not hot Bodies communicate their Heat to contiguous cold ones, by the Vibrations of this Medium, propagated from them into cold ones? and is not this *Medium* exceedingly more rare and ſubtle than the *Air*, and exceedingly more elaſtick and Active, *&c.*?" *Optic.* Queſt. 18.

Beſides theſe Uſes, as Philoſophy has not yet been able to aſcertain them all, it is not unreaſonable to ſuppoſe that this *Fluid* may be likewiſe the *Vehicle* of the heavenly Bodies, and its *Currents* the Cauſe of their *Rotation*, at that ſame Time that *Gravity* and *Attraction* may give them their *Direction*. Juſt in the ſame Manner as we may attract a Sphere of Wood, if caſed in a thin covering of Iron, and left to float in a Veſſel of Water, by applying a Loadſtone to the Sides of it.

manifeſted by their Glory and Verdure, when they are expoſed in a free and wholeſome Air; and contrariwiſe, by their pale and ſickly Hue, and their languiſhing or dying when they are ſecluded from it.

A *Body of Waters* then ſufficient for theſe Uſes, of *Humidity* and *Refreſhment*, being thus collected *above* the Firmament, what remained of them *under* the Firmament, was left to be contained in the vaſt Cavities of the *Ocean*, *Rivers*, *Lakes*, and *Seas*.

The collecting of the Water, &c.

V. The collecting of theſe into their proper Places was the next Operation of God's Almighty Power.

For having on the ſecond Day determined the Place of the Heavens, by making them the Diviſion and Boundary between the Waters above, and the Waters below, he proceeded, and ſaid, Let the Waters under Heaven be gathered together into one Place, and let the dry Land appear; and it was ſo. And God called the dry Land Earth; and the gathering together of the Waters he called Seas. And God ſaw, that it was good.

While the Earth was a *Chaos*, I obſerved to you before, that the *fluid* Parts of the Globe muſt needs be *uppermoſt*, and did really cover the Solid, till it pleaſed God to ſeparate them, by providing great Receptacles for the Waters: and it is moſt probable, that he raiſed the Mountains by the very Operation, that he made the Cavities for the Seas.

For beſide, the wholeſome Temperature of the Air, and a comfortable Reſidence upon dry Ground, there was wanting for human and animal Uſes, as well as for the Growth of divers Sorts of Vegetables, ſome of which delight in high Lands and ſome in low, a Variety of Elevation and Deſcent in the Face and Figure of the Earth itſelf.

Whether this were done by immediate Application of his Almighty Power, or the Inſtrumentality of ſecond Cauſes is not ſo eaſy to determine. It might be poſſibly effected by the very Cauſe which produces Earthquakes, to wit, ſubterraneous Fires and Exploſions. [We ſee what incredible Effects attend the Firing of an artificial Compoſition of Matter, made by the Hands of Men. How it makes its Way through the moſt ponderous Work of Art; rends even the natural Rocks aſunder, and elevates the Earth with its incumbent Towers and Palaces to fall into Ruin and Confuſion; why then, in the Hands of God, might not a proportionable Quantity of ſuch Materials, when ſet on fire, raiſe up the Shell of the Earth in Ruins, and by thoſe Ruins produce the Mountains; or in a more equable Manner, elevate the reſt of the Superficies of the dry Land above the Waters.] This ſeems to be the Language of Scripture in the 104 Pſalm, which has generally been eſteemed a Comment upon the *Moſaic* Account of the Creation. For the Pſalmiſt, after deſcribing the Waters, as ſtanding at firſt above the Mountains, aſſigns the Cauſe of the Alteration, by ſaying, at thy Rebuke they fled, at the Voice of thy Thunder they haſted away. Now we know that an Earthquake is ſubterraneous Thunder, and during the Thunder, as the Waters ſo haſted, he adds, that the Mountains aſcended, and the Valleys deſcended into the Place, which thou haſt prepared for them.

The Appearance of dry Land, &c.

VI. The Sea ‡ being thus reduced within its Bounds, and the dry Land appearing, but without any promiſing Aſpect, made up of ſandy Cavities, and Hills, and horrid, and uncouth in native Duſt, God ſet himſelf to cloath the

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‡ The *Depth* of the *Sea* has been thought by ſome to anſwer the *Height* of the *Mountains*. For this Reaſon the Height of the Mountains may be conſidered either with Reſpect to the Depths of the Sea, or to the Ground, upon which the Stations are taken to meaſure it. *Olympus* was found by *Xenocrates* to riſe above ten *Stadia* higher than the Temple of *Apollo* built at the Foot of it. The *Ancients* meaſured others; but both they and the *Moderns* are liable to Uncertainties, by Reaſon of *Refraction*. It is probable the Ancients left it out of their Account. For which Reaſon, the Mountains, meaſured by them, are reckoned higher than they ought to be.

Mr. *Boyle*, in his Treatiſe of *Subterranean and Submarine Regions*, mentions a *Traveller*, who on the other Side of the *Line*, about the Latitude 35. let down 400 Fathoms of Line, with a Lead of 30 or 35 Pounds weight, which, by going ſo deep, was found to come up again as cold as Ice. *Julius Cæſar* found the Depths of the *Mediterranean* and *Adriatick* in ſome Parts to be 15 *Stadia*, almoſt 2[illegible] *Engliſh* Miles deep, the moſt elevated Mountain of the *Alps* is about as high: but the Sea in other Places has been found to be nearer ſix Miles deep, with great and ſudden Inequalities. See more of this in Dr. *Long*'s Aſtronomy, p. 164. and Mr. *Boyle*'s Treatiſe abovementioned.

the barren Earth with Verdure, and covered its Deformity, with the Beauties of the Vegetable Creation.

And God ſaid, let the Earth bring forth Graſs, the Herb yielding Seed, and the Fruit-tree yielding Fruit, after its Kind, whoſe Seed is in itſelf upon the Earth, and it was ſo. And the Earth brought forth Graſs, and the Herb yielding his Seed after his Kind, and the Tree yielding Fruit, whoſe Seed is in itſelf, after his Kind: And God ſaw that it was good. And the Evening and the Morning were the *third* Day.

The moſt remarkable Circumſtance then in the *Moſaic* Account, of the *Vegetable* Creation, is that of containing their *Seed within themſelves.*

The Form of this Seed, and the Manner of its Propagation is compared by * *Empedocles,* an antient Philoſopher, to an *Egg* falling from the Body of the Creature, that produces it. For it will appear more evident, as we proceed further, that TREES, and PLANTS are a Sort of *fixed Animals*; and as they are confined to one particular Spot, and cannot approach each other for Propagation; therefore Divine Providence has contrived for the Preſervation of their Species, a Method ſuitable to their State of Being, and ordained that their Seed ſhould be in themſelves, and contain the Rudiments and Lineament of the Parent-vegetable, tho' ever ſo large and ſpacious.

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* *Vetus eſt Empedoclis Dogma Plantarum Semina* OVA, *eſſe ab iiſdem decidua*—Malpighi. p. 81.

For the Preſervation of this Seed, there are numberleſs Contrivances, in the Structure of the Thing itſelf, and the different Forms, which it puts on, at different Seaſons of the Year.

Nor are the Methods of *propagating theſe Seeds* leſs ſurprizing. For when left in a State of Nature, *ſome* are ſupplied with a light Kind of Down for Wings, to be carried about, and ſcattered by the Winds; others are laid up in elaſtick Caſes, which they burſt by their own Force, when they are at Maturity, and ſo dart forth to a convenient Diſtance, herein performing for themſelves the Office of an Huſbandman: *others* by their agreeable Taſte or Smell, inviting the Birds to ſwallow them, are fertilized by paſſing through their Bodies, ſcattered and diſſeminated, in their ‡ Flight, and if their Paſſage be long, carried by them to great Diſtances. Some, for Inſtance, from the *Southern* Iſlands to the *Indies*, without giving to Man the Trouble of their Propagation.

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‡ This is affirmed particularly of the *Miſletoe* and the *Nutmeg*, as may be ſeen in the Accounts of *Tavernier*, *Thevenot*, and *Ray*, quoted by Dr. *Derham* in his *Phyſico-Theology*, where, and in Dr. *Hales*, the Reader may ſee more Particulars relating to Vegetation, than could be here extracted, as the narrow Bounds of a *Sermon* confined the Author's Remarks, to the following *general* Heads, viz. the *Seed* of Vegetables, the *Propagation* of that Seed, the *Fabrick* and *Growth* of Vegetables, and the *Operations* tending to ſupport the ſame.

Again, the *Growth* of Vegetables afterwards, is as wonderful and CURIOUS, as their Birth and firſt Production: whether we look to the Figure and Structure of the whole, or examine diſtinctly thoſe Parts or Veſſels, which inhale or imbibe the Air and Water, or throw off the Sap by Perſpiration, after a Combination of Cauſes, as well internal as external, have contributed their Aſſiſtance.

For if we look to the *Structure* of the whole, we may obſerve throughout ſuch a Series of Connections as will afford us good Reaſon to imagine, that there is a direct communication from End to End; and that the ſame Fibres, which conſtitute the Root, Trunk, and Branches, are extended to the very Fruit itſelf.

To ſupport this *Whole*, that is, the *general Fabrick* of the Plant, there is admirable Proviſion made for the Conveyance of the *lymphatick* and *eſſential* Juices; and alſo for throwing off the redundant and perſpirable Matter, and for the Admiſſion and Conveyance of the Air, upon the Temperament of which depends their *elaſtick* or *lax* Fibre, that is, their Sickneſs or Health, and the Functions of *vegetable*, as well as *animal* Life.

Theſe *Tracheæ* or * Air-veſſels are particularly viſible, and appear very curious in the Leaf of the *Scabious*, and the *Vine*. For by pulling aſunder ſome of its principal Ribs, or Fibres, one may diſcern between them the *ſpiral* Air-veſſels like Threads of Cobwebs a little uncoiled. Concerning the *Leaves* likewiſe, there are ſome Things too remarkable to be paſſed over in Silence. Whether we regard their *Uſe* as Inſtruments of Communication and Perſpiration; or their Form and Contrivance to anſwer thoſe Purpoſes: as firſt, The Poſition of their Fibres, which ſtand not in an even Line upon the Stalk, but always in an angular or circular Poſture, and their vaſcular Fibres or Threads are 3, 5, or 7, in Number. The Reaſon of this their Poſition is for the more erect Growth, and greater Strength of the Leaf; as alſo for the Security, and more regular Conveyance of their *Sap*. The Art in folding up the Leaves alſo, before their Eruption out of their *Gems*, is incomparable,

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* I have in many Inſtances ſhewn (ſays Dr. *Hales*,) That Air freely enters the Veſſels of Trees, and that it is in great Abundance wrought into their Subſtance. *Quære*, May not the Uſe of thoſe ſpiral Wreaths, that are coiled round

round the Inſides of thoſe Veſſels which are ſuppoſed to be Air-veſſels, and which are manifeſtly to be ſeen in ſeveral *Trees*, as alſo in the Leaves of the *Vine*, and *Scabious*, may not theſe be deſigned by Nature to promote the quicker Aſcent of any Liquor, as the Sap, which aſcends moſt freely through innumerable other capillary Veſſels, which have no ſuch ſpiral Coils in them? Not that we are to ſuppoſe the Air in its elaſtic State actually to touch, and thereby to be determined in the Courſe of theſe Spirals as any Liquor would be. But as the Rays of Light, when they are reflected from a ſolid Body, are found to be reflected without actually touching the reflecting Body, in the Point of Reflection; ſo it is not unreaſonable to ſuppoſe, that elaſtick Air may, like Light, be directed from one Courſe, and diverted to another by the ſolid Bodies it approaches, without touching them.

II, I obſerve that theſe *Spirals* are coiled in a Courſe oppoſite to the Courſe of the Sun, *viz.* from Weſt to Eaſt HALES's *Statical Eſſay*. Vol. II. p. 265, &c. &c.

parable, both for Elegance and Security. For inſtance in taking up, as their Shape and Form admit, the leaſt Room, that is poſſible and in being ſo conveniently couched, as to be capable of receiving Protection from other Parts, or of giving it to one another. For Example, firſt, there is the *Bow-lap*, where the Leaves are all laid ſomewhat convexly, one over another, but not plaited: and, where the Leaves are not ſo thick ſet, as to ſtand in the *Bow-lap*, there we have the *Plicature*, or the *Flat-lap*, as in Roſe-trees. If from the *Leaves* we make a Tranſition to *Flowers*, the firſt Curioſity which preſents itſelf will be what ſome Writers call the *Empalement*; others the *Calix* or *Perianthium*, which is the *Baſis* and *Support* of the Whole. FLOWERS, whoſe *Petala* are ſtrong (as *Tulips*) have no *Calix*. *Carnations*, whoſe *Petala* are long and ſlender have an *Empalement* of *one* Piece; and others, ſuch as the *Knap-weeds*, have it conſiſting of ſeveral Pieces, in divers Rounds, and all with a counterchangeable Reſpect to each other, for the greater Strength and Security of themſelves, and the *Petala*, which they include.

For next to the *Calix* in Order aſcending are the *Petala* themſelves, or *Foliations*. In theſe not only the admirable Beauty, and luxuriant Colours are obſervable, but alſo their curious Foldings in the *Calix*, before the Expanſion.

As to the *Stamina*, with their *Apices*, and the *Stylus*, called the *Attire*, they are alſo wonderful, whether we conſider their *Colours* or *Make*, moſt eſpecially their *Uſe*, namely, if they ſerve as a male *Sperm* to impregnate, and fructify the Seed, which Opinion is corroborated by ſome ingenious Obſervations in the philoſophical Tranſactions.

Theſe are generally the ſeveral *Stages* and *Gradations* in the Growth of a *Vegetable*; which all depend upon the annual Diffuſion of the Sap and Juices, the Cauſes of which are either *internal* or *external*. The *internal* Cauſe of the Aſcent of the *Sap* is principally that Propenſity, which there is in the Juices of Vegetables, to extraordinary * Fermentation.

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* This may be owing, amongſt other Cauſes, to their abounding with *Acids*, in his Thoughts, about the Nature of which (ſays Dr. *Hales*, vol. i. p. 293,) the illuſtrious Philoſopher, Sir ISAAC NEWTON, gives a rational Account of *Fermentation*: " The Particles of Acids are " endued with a great attractive Force, in which their Ac- " tivity conſiſts—By this attractive Force they get about " the Particles of Bodies, whether they be of a *metallick* " or *ſtoney* Nature, *&c.* by their attractive Force alſo, by " which they ruſh towards the Particles, they move the " Fluids, and excite Heat, and ſhake aſunder ſome " Particles ſo much as to turn them into *Air*, and generate " Bubbles: and this is the Reaſon of Diſſolution, and all " violent Fermentations." *Harris*. Lex. Tech. Vol. II. Introduction. The Phyſician here mentioned was the great Dr. *Sydenham*, who ſays, " That it is to be obſerved " that a convenient Mixture doth more effectually digeſt " the Humours than any one ſingle Remedy. For tho' " when we ſtand in need of the ſpecifick Virtue of any " Medicine, that Rule certainly takes Place, that the " *ſimpleſt Preparation is the beſt*; yet, when we endeavour to " cure a Diſeaſe, by anſwering a certain Indication, every " Ingredient contributes to the Work, and the Medicine " moſt compounded will operate moſt effectually". In which

tion. To which Cauſe alſo, the ableſt practical Phyſician, that ever this Nation produced, hath aſcribed their *Efficacy*, when acting in larger *Compoſitions*.

But with regard to the ‡ Aſcent of the Sap, it will be hard to find any natural Agent equal to the Buſineſs, except it be *Fermentation.*

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which Caſe, for the Advantage of young *Phyſicians*, he proceeds to preſcribe ſome complicated Forms of *Vegetable* Electuaries, in which he ſays, “The *Virtue* of the Ingredients is exalted by FERMENTATION”

‡ After introducing the above Quotation from Sir *Iſaac Newton*, and giving us a comment upon it, to ſhew that *Fire* and *Fermentation* will produce from *vegetable* Subſtances as well as *animal* and *mineral* AIR, ſo elaſtick as to raiſe the *Mercury* (in his Experiments 88. 89.) nay, and that this *Air* will continue in that elaſtick State for many Months and Years, tho' cooled by ſevere Froſts,—p. 294: nay farther, after adding his own Account of the Power and Force of *Fermentation*, and Confeſſion, p. 292. that all vegetable and animal Fluids are in a natural State, in ſome Degree of Fermentation:

Dr. *Hales* ſhould, nevertheleſs in a Paſſage, particularly relating to the Motion of the *Sap*, never mention FERMENTATION as a *principal* Cauſe of *Vegetation*, is really ſurprizing, when it is as obvious to the Obſervation of common Senſe, that the Riſe of the *Sap* is owing to the *Fermentation*, occaſioned by the Action of the *Sun* upon the *Root* and *Sides* of the Vegetable, as that *Ebullition* or *Efferveſcence*, occaſioned by the Application of Fire to the Bottom and Sides of the Cauldron ſhould be the immediate Cauſe, why the Water raiſes itſelf above the Sides of the Cauldron. And yet this Cauſe ſo obvious and undeniable, I ſay is never ſo much as mentioned in the following Solution, where nevertheleſs the Perſpiration he aſſigns as a *Cauſe* of the Sap's riſing, is only the *Conſequence* of this *Efferveſcence* and *Fermentation*; as *Sweat* is the Conſequence of *Heat* in ANIMALS. The Want of *Spiracula* at the Extremities when the Leaves, *&c.* are gone, only *tion.* For tho' the *Attraction* of the Branches may aid and aſſiſt, when the Sap is riſing, and ſo be *ſubordinate* and *co-efficient*; yet it is evident, that Attraction alone cannot effect it, becauſe there is no Riſing of the Sap, but at the Seaſon, tho' it be certain, *Attraction* muſt continue all the Winter.

As this Cauſe therefore is deficient, and as Plants and Vegetables are on the other Hand deſtitute of ſuch forcible Engines as the *Lungs* and *Heart* to *pump* up the vital Juices, and diſtribute them continually to every Branch and

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only ſhews that there was not a call as uſual for the Sap, *when raiſed*, and that the Want of this Call or Diſcharge, as in an *animal Body*, might cauſe a *Repletion*, which might counteract the other Cauſe, ſtill however ſubſiſting. The Reader may judge of this Reply, when he has peruſed the Paſſage. For I do not deny but that the *internal* Cauſes aſſigned by the Doctor may be *ſubordinate* and *co-efficient*; but I contend at the ſame Time that *Fermentation* is the *Principal*, and believe, that whoever has obſerved the Sap boiling out at one End of a Faggot ſtick, when the other End has been on Fire, will own that when the *Perſpiration* by the *Leaves* is over, and the *Leaves* all dead and gone, the Remainder of the Sap will nevertheleſs move on by Effervеſcence or Fermentation. Whereas, ſays the *Doctor*, in Vegetables we can diſcover "no Cauſe of the "Sap's Motion, but the ſtrong Attraction of the Capil-"lary Sap-veſſels, aſſiſted by the briſk Undulations and "Vibrations cauſed by the *Sun*'s Warmth, whereby the "Sap is perſpired off through the Leaves: but when the "Surface of the Tree is greatly diminiſhed by the Loſs of "its Leaves, then alſo the Perſpiration and Motion of the "Sap is proportionably diminiſhed, *&c.*" This I think I have accounted for above, by ſhewing, that tho' the Sap attempted ſtill to riſe in the ſame Quantity, there would not in this Caſe be Room to receive or diſpoſe of it, by Reaſon of Repletion.

Member of their Bodies, there muſt be ſomething in the Sap or Juice itſelf, and (what ſo natural and efficacious as Fermentation ?) which, when aſſiſted by other Cauſes, may produce in Plants an Effect ſo ſimilar to that in Animals.

☞ Theſe Cauſes will therefore be *external*, of

☞ Dr. *Deſaguliers*, in his Abſtract of the firſt Volume of his Book, obſerves, "That the Heat of the Sun "ſhould rarefy the Moiſture of the Earth to this Degree, "or a great deal more, to drive it into the Roots of the "Plants, is very probable from ſome Obſervations, that "Mr. *Beighton*, F. R. S. and himſelf made upon the Engine, to raiſe Water by Fire; whereby it appears, "that the Steam or Vapour of boiling Water is rarer "than Water above 13000 Times, when its Elaſticity is "equal to that of common Air. *Philoſophical Tranſactions.* "No. 398."

Dr. *Hales* ſays, that he had obſerved it from Thermometers fixed at ſeveral Depths under Ground, that when in *March* the Sun ſhined bright all Day, notwithſtanding there was a briſk very cold eaſterly Wind, it had conſiderable Influence in warming the Earth to ſome Depth; upon which he remarks, not very conſiſtently with his Opinion above, "That doubtleſs the Sun has "then the like Influence upon the inner Parts of Trees, "whereby it *agitates* and *raiſes* the Sap." Vol. II. p. 258.

Concerning the Force and Velocity of the Sap, Dr. *Hales*, p. 109. of his *Vegetable Staticks*, Experiment xxxiv. The *Time* March 31, and April 1ſt. *Weather*, the *Thermometer* three Degrees above the freezing Point, and a white Hoar Froſt, ſays, the Sap of a Vine in the bleeding Seaſon had riſen the laſt Night 3+¼ Inches, afterwards it would riſe at the Rate of Ten Feet or more in a Day. In the Height of the bleeding Seaſon it would continue riſing the Night and Day; but much more in the *Day* than the Night, and moſt of all in the greateſt *Heat* of the Day, *&c.*

This plainly ſhews the *primary* Cauſe of the Sap's Motion, of which the *Temperature* of the *Atmoſphere* will be the more immediate, but the more powerful and *principal*, the particular Diſpoſition of the heavenly Bodies, without which there could be no Variety of *Seaſons* and *Climates*, and of conſequence no Variety in the Productions of the Earth, and therefore we are informed by Scripture, that one End and Purpoſe, for which God created the LIGHTS of Heaven, was to diſtinguiſh the ſeveral *Seaſons*, and give *Variety* to the revolving Year.

The Appointment of the Seaſons.

VII. And God ſaid, let there be Lights in the Firmament of the Heavens, to divide between the Day and the Night, and let them be for Signs and for Seaſons, for Days and Years.

As I obſerved, when deſcribing the firſt Creation of Light, that the Order and Symmetry of the World would have been loſt without it: So I muſt remark here, that the vegetable Part of the Creation, in particular, could have been of no Service, either to Men or Brutes, if all its Tribes had lain concealed in Darkneſs.

The *Virtues* of Plants in this State, could hardly have been known, and their *Beauties* never diſcovered, since Colours totally depend on Light. As the inferior Parts of the Creation

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tion, and how little Attraction was concerned in it. Since it appears from hence, that the external Cauſe is *Heat*, and the internal the Increaſe of Fermentation and Ebullition in Proportion to the Intenſeneſs of the Heat.

tion therefore were all to ſerve the Uſes of Animals, God created Light before he created Animals: but as this Light, (probably no other than the Element of Fire ſeparated, as much as could be ſpared, from the Texture of animal, vegetable, and natural Bodies) occupied indiſcriminately all the upper Region, without acting in thoſe particular Directions, neceſſary to the Wants of the Univerſe, now advancing nearer to Maturity and Perfection: God created the *Sun*, *Moon*, and *Stars*, for the more regular, and exact Conveyance of Light and Heat, in ſuch a Manner as ſhould ſuit the Neceſſities of each Part of the Univerſe, and gave the * Axis of the Earth, at the ſame Time, ſuch an Inclination to the Plane of its Orbit, in which it traverſes the Sun, that upon its Entrance into *Capricorn*, the central ſolar Ray might fall upon the northern Tropick, and make our Summer; upon its entrance into *Libra* fall upon the Æquator, and make the *vernal* Æquinox, upon its Entrance into *Cancer*, fall upon the Southern Tropick, and make our Winter; and again upon its Entrance into

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* According to Dr. *Burnet*'s Opinion, the Fertility and Paradiſiacal State of the firſt Earth was entirely owing to a perpetual *Æquinox*, the Conſequence of the Situation of its *Axis*, which he ſuppoſes to have been then parallel to the Axis of the *Ecliptick*, in which it was carried about the Sun with the other Planets.

But this does not accord with the *Moſaick* Account, which ſuppoſes a *Variety* of Seaſons, to commence from the Creation of the heavenly Bodies, as that was one of the *Uſes*, for which they were ordained.

Aries, make the *autumnal Æquinox*, or the Equality of Day and Night, preceding the Autumn.

By this Regulation there is ſuch a Diſtribution of Light and *Heat* at different Times, and in different Degrees, throughout the Globe, as makes that Variety, which we obſerve in the Produce of the Earth, and all the grand Revolutions in the Vegetable World, particularly that principal one, which to them holds the Place of a Reſurrection, or a Renewal of their Nature, I mean the Aſcent of the Sap, and the conſequent Vernation in the Spring, of which, tho' the *internal* Cauſe, as I obſerved before, may be the high Fermentation, natural to vegetable Juices, yet the *external* is owing to the State of the *Atmoſphere*, which depends ultimately upon the Revolutions, Aſpects and Attractions of the heavenly Bodies, and the well-tempered Influence of that Lord of Life and Death to Plants, the great Ruler of the vegetable World, the Sun.

Who viſiting by Turns, all Parts and Quarters of the Globe, gives that variety to the Product of the Earth, which makes every Climate remarkable for the Growth of ſome particular Commodity; and every Seaſon deſirable for affording ſome Delicacy peculiar to itſelf, the whole of which, as they were evidently created for the Uſe of Man, we have a Right, thro' God's Bounty, to enjoy; but ſtill in a reaſonable Manner, and without Abuſe.

Partaking therefore of his Benefits, let us remember the Giver of all good Gifts, and render him as Creator and Preſerver of this habitable World, All Honour and Glory, Might, Majeſty and Dominion, now and for ever.

FINIS.